

**REMARKS**

Claims 1, 2, 5, 6, 7, 10, 11, 18, 20, 27, 38, 44, 227 and original dependent claims 337-346 have been amended and claims 3, 4, 65-95, 101-217 and 326 have been canceled.

\* Attached hereto is a marked-up version of the changes made to the claims and specification by this amendment. The attached pages are captioned "Version With Markings to Show Changes Made."

**Election/Restriction**

The claims of Group II (claims 216 and 217) have been canceled as drawn to a non-elected invention.

**Claim Objections**

The cancellation of claim 326 and the amendment to original dependent claim 337 (now renumbered as claim 338) are submitted as overcoming the objections in paragraphs 3 and 4 of the Office action.

**Information Disclosure Statements**

Applicants filed an Information Disclosure Statement on July 1, 2002. At the request of the Examiner, the Information Disclosure Statement was shipped directly to the Examiner by Federal Express nearly two months prior to the mailing date of the Office action in order to ensure its consideration before issuance of the first Office action. However, the Office action does not include an initialed copy of the Form PTO/SB/08A accompanying the Information Disclosure Statement. Furthermore, the Patent Application Information Retrieval (PAIR) system does not verify the filing of the Information Disclosure Statement.

In the telephone conversation with the undersigned attorney on September 26, 2002, the Examiner advised that the art cited in the Information Disclosure Statement had not been considered in connection with the preparation of the Office action. The Examiner further advised that he would review the information submitted by applicants in the Information Disclosure Statement and issue a supplemental Office action if additional grounds for rejection were identified. Applicants have not received a supplemental Office action.

Applicants request that a copy of the initialed Form PTO/SB/08A accompanying the Information Disclosure Statement filed July 1, 2002 be returned with next communication from the Patent Office in connection with this application.

In addition, applicants wish to advise the Examiner that a Supplemental Information Disclosure Statement will be filed shortly in connection with this application and respectfully request that the Examiner contact the undersigned attorney by telephone if the Supplemental Information Disclosure Statement is not received before issuing the next action on the merits.

**ALLOWABLE SUBJECT MATTER**

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Applicants acknowledge the allowance of claims 96-100, 337, 338 and 340-347.

Applicants note that 337 was inadvertently duplicated in the original claim numbering. Accordingly, applicants have renumbered the dependent claims following original independent claim 337 as claims 338-347 and corrected the dependencies of these claims. In addition, applicants have made a number of editorial changes to the claims.

The indication of allowable subject matter in claims 4-43, 47-51, 55, 63, 67, 68, 77-95, 106, 114, 120-134, 137-146, 149-152, 176-187, 191-216, 225, 236 and 327-336 is acknowledged.

Claim 1 has been rewritten to incorporate the requirements of dependent claims 3 and 4. Accordingly, claim 1 and dependent claims 2 and 5-43 are submitted as in condition for allowance.

**Rejections under 35 U.S.C. §112, Second Paragraph**

Applicants respectfully request reconsideration of the rejections of claims 27, 164-169, 227, 242-277 and 339 under 35 U.S.C. §112, second paragraph.

Mother liquor is a well-known term of art in the field of crystallization and refers to retained liquid in the two-phase mixture (or magma) produced upon precipitation of crystal solids from solution. In claim 27, mother liquor refers to the liquid portion of the primary product slurry produced upon precipitation of N-(phosphonomethyl)glycine crystals as water is evaporated from the primary fraction. Accordingly, contrary to the assertion in the Office action, mother liquor, by definition, is produced upon precipitation of N-(phosphonomethyl)glycine crystals from the primary fraction and retained in the primary product slurry; not evaporated from the primary fraction.

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As defined in applicants' specification at page 70, lines 1-12:

"the percentage of oxygen utilized equals: (the total oxygen consumption rate  $\div$  oxygen feed rate)  $\times$  100%. The term total oxygen consumption rate means the sum of: (i) the oxygen consumption rate ( $R_i$ ) of the oxidation reaction of the N-(phosphonomethyl)iminodiacetic acid substrate to form the N-(phosphonomethyl)glycine product and formaldehyde, (ii) the oxygen consumption rate ( $R_{ii}$ ) of the oxidation

reaction of formaldehyde to form formic acid, and (iii) the oxygen consumption rate ( $R_{iii}$ ) of the oxidation reaction of formic acid to form carbon dioxide and water."

In light of this definition, the terminology of claims 164-169 is unambiguous.

The instant amendment to claim 227 obviates the rejection in paragraph 8 of the Office action.

Sensible heat is the heat energy stored in a substance as a result of an increase in temperature. Accordingly, "the difference in unit weight sensible heat content between said reaction mixture and said aqueous feed stream less than the exothermic reaction heat generated in the reaction zone per unit weight of the aqueous feed stream" as recited in claim 242 refers to the exothermic heat energy stored in the reaction mixture on a per unit weight basis and is required to be maintained less than the exothermic reaction heat generated in the reaction zone per unit weight of the aqueous feed stream. That is, the reaction zone comprising a primary fixed bed is not operated adiabatically (See, for example, applicants' specification at page 96, line 3 et seq.).

Applicants assume that the rejection in paragraph 10 of the ~~Office action applies to original dependent claim 338~~ (now renumbered as claim 339). The instant amendment to claim 339 is submitted as overcoming the rejection for indefiniteness.

In view of the foregoing, applicants respectfully request withdrawal of all claim rejections under 35 U.S.C. §112, second paragraph.

**Rejections under 35 U.S.C. §102(b)**

Claims 1 and 2 are rejected under 35 U.S.C. §102(b) as anticipated by the disclosure in U.S. Patent No. 6,232,494 (Morgenstern et al.). Although this rejection has been obviated by the present amendment to claim 1, applicants wish to point out that this reference (issued May 15, 2001) is not prior art against the subject application (filed May 22, 2001) under 35 U.S.C. §102(b).

Rejections under 35 U.S.C. §103(a)

Reconsideration is respectfully requested of the rejection of claims 44-46, 52-54, 56-62, 64-66, 69, 70-76, 101-105, 107-113, 115-119, 135, 136, 147, 148, 153-175, 188-190, 217-224, 226-235, 237-241, 278-289 and 290-326 under 35 U.S.C. §103(a). The invention defined in the pending claims is submitted as patentable over the disclosure in U.S. Patent No. 6,232,494 (Morgenstern et al.) in view of U.S. Patent Nos. 5,202,479 (Fujiwara et al.) and 6,417,133 (Ebner et al.).

Morgenstern describes a process for the preparation of glyphosate compounds by catalytic oxidation of **an N-substituted** glyphosate reactant in the presence of a noble metal catalyst. Contrary to the assertion on page 4 of the Office action, Fig. 2 and the accompanying text at col. 25, line 57 to col. 26, line 11 of Morgenstern do not disclose a process for making glyphosate via the oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate (i.e., N-(phosphonomethyl)iminodiacetic acid, a salt of N-(phosphonomethyl)iminodiacetic acid, or an ester of N-(phosphonomethyl)iminodiacetic acid) as called for in the pending claims. Rather, the oxidation substrate described in this portion of the text of Morgenstern is **an N-substituted** glyphosate reactant having a single N-carboxymethyl functionality (e.g.,

NMG). In a preferred embodiment, Morgenstern discloses oxidizing the N-substituted glyphosate reactant in a stirred tank reactor (See col. 23, lines 43-63 and Example 27). Applicants cannot find any disclosure in Morgenstern of "multiple reaction zones" as contended on page 4 of the Office action. Morgenstern discloses partially evaporating the oxidation reaction product mixture to precipitate at least a portion of the N-(phosphonomethyl)glycine product, separating the precipitate by centrifugation and recycling at least a portion of the centrate (i.e., mother liquor) remaining after removal of the solid product to the same oxidation reactor (See col. 24, lines 34-44; col. 25 lines 31-41; and col. 25, line 64 to col. 26, line 11).

The characterization of the disclosure in Morgenstern on pages 6-8 of the Office action is difficult to follow so as to understand the application of the teachings of the primary reference against the requirements of the rejected independent claims, and at times is wholly inaccurate. For example, the contention on page 6 of the Office action that the "[f]lows of gas and liquid are necessarily cocurrent since the gas is dissolved in the liquid" is unfounded.

Fujiwara discloses a non-catalytic process for preparing glycine by reacting glycolonitrile, carbon dioxide gas, ammonia and water to obtain a reaction solution containing glycine and recovering glycine crystals from the reaction solution by a two-step concentration procedure including recycle of gaseous components and mother liquor to the reaction zone (See col. 2, line 63 to col. 3, line 20; and col. 7, line 24 to col. 8, line 32).

Ebner discloses a deeply reduced noble metal on carbon catalyst which is characterized by a CO desorption of less than

1.2 mmole/g, preferably less than 0.5 mmole/g, when a dry sample of the catalyst, after being heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before being exposed to an oxidant following the heating in the hydrogen atmosphere, is heated in a helium atmosphere from about 20° to about 900°C at a rate of about 10°C per minute, and then at about 900°C for about 30 minutes. The catalyst is further characterized as having a ratio of carbon atoms to oxygen atoms of at least about 20:1, preferably at least about 30:1, at the surface as measured by x-ray photoelectron spectroscopy after the catalyst is heated at a temperature of about 500°C for about 1 hour in a hydrogen atmosphere and before the catalyst is exposed to an oxidant following the heating in the hydrogen atmosphere. Ebner describes using the disclosed catalyst in various oxidation reactor systems to oxidize N-(phosphonomethyl)iminodiacetic acid substrate to produce N-(phosphonomethyl)glycine. Batch, semi-batch and continuous oxidation reactor systems including stirred tank, fixed bed, trickle bed, fluidized bed, bubble flow, plug flow and parallel flow reactors are mentioned (See col. 21, lines 41-47).

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Claim 44

Claim 44 is directed to process for making an N-(phosphonomethyl)glycine product in which a reaction product solution containing N-(phosphonomethyl)glycine product is produced by catalytically oxidizing an N-(phosphonomethyl)iminodiacetic acid substrate in an oxidation reactor system. N-(phosphonomethyl)glycine product is recovered by two sequential crystallizations from the reaction product solution. More particularly, N-(phosphonomethyl)glycine product

is precipitated from the reaction product solution to produce a primary product slurry comprising precipitated N-(phosphonomethyl)glycine product crystals and a primary mother liquor. As amended, claim 44 requires separating precipitated N-(phosphonomethyl)glycine product crystals from the primary mother liquor and, thereafter, evaporating water from the primary mother liquor to precipitate additional N-(phosphonomethyl)glycine product crystals and produce a secondary mother liquor.

Although Morgenstern discloses partially evaporating the oxidation reaction product mixture to precipitate at least a portion of the N-(phosphonomethyl)glycine product, the resulting mother liquor is not subjected to a subsequent crystallization step to precipitate additional product crystals as required in claim 44. Instead, Morgenstern teaches optionally recycling the mother liquor centrate to the oxidation reactor. Similarly, the glycine recovery scheme of Fujiwara includes a single crystallization step such that even if one were to combine the teaching of these two references, the process defined in claim 44 could not be obtained. Ebner, discloses isolating the N-(phosphonomethyl)glycine product by precipitation, for example, by evaporating a portion of the water and cooling (See col. 24, lines 61-64), but does not teach or suggest serial precipitation of N-(phosphonomethyl)glycine product, first from the reaction product solution and then from the resulting mother liquor. Accordingly, the cited art does not establish a *prima facie* showing of obviousness and applicants respectfully submit that claim 44 and dependent claims 45-51 are therefore patentable over these references.

Claim 52



Claim 52 is directed to a process for making an N-(phosphonomethyl)glycine product in which a reaction product solution comprising N-(phosphonomethyl)glycine product is withdrawn from a primary oxidation reactor system and divided into plural fractions including a primary fraction and a secondary oxidation reactor feed fraction. The secondary oxidation reactor feed fraction is introduced into a secondary oxidation reactor system comprising one or more oxidation reaction zones wherein unreacted -(phosphonomethyl)iminodiacetic acid substrate is oxidized to produce a secondary oxidation reactor effluent comprising additional N-(phosphonomethyl)glycine product. N-(phosphonomethyl)glycine product crystals are recovered by precipitation from both the primary fraction and the secondary oxidation reactor effluent (See, for example, Fig. 14A). The presence of the secondary oxidation reactor system 316 in the reaction system shown in Fig. 14A permits the primary oxidation reactor system 303 to be sized and operated more economically and improves overall system flexibility.

As noted above, Morgenstern discloses partially evaporating the oxidation reaction product mixture to precipitate at least a portion of the N-(phosphonomethyl)glycine product and recycling the mother liquor centrate remaining after removal of the solid product to the **same** oxidation reactor. At the top of page 5 of the Office action, the Examiner has apparently acknowledged that the process defined in independent claim 52, which requires that the secondary oxidation reactor feed fraction be introduced into a **separate**, serial secondary oxidation reactor systems prior to precipitation of N-(phosphonomethyl)glycine product crystals, is distinguished from this disclosure in the primary reference. The shortcoming in teaching of Morgenstern cannot be overcome by

resort to either Fujiwara or Ebner such that a *prima facie* showing of obviousness is lacking. Accordingly, the invention set forth in independent claim 52 and dependent claims 53-64 are submitted as patentable over the cited art.

Claims 65 and 101

Independent claims 65 and 101 and dependent claims 66-95 and 102-215 have been canceled from the present application without prejudice to their patentability and later presentation in a continuing application.

Claim 188

Claim 188 is directed to operation of the crystallizer system shown in Fig. 12A used to recover an N-(phosphonomethyl)glycine product from an oxidation reaction mixture. The process comprises introducing an aqueous evaporation feed mixture comprising an aqueous starting solution (e.g., the oxidation reaction mixture) into an evaporation zone wherein water is evaporated from the feed mixture in the presence of solid particulate N-(phosphonomethyl)glycine product to produce a vapor phase comprising water vapor, precipitate N-(phosphonomethyl)glycine product from the aqueous liquid phase, and produce an evaporation product comprising N-(phosphonomethyl)glycine product solids and a mother liquor that is substantially saturated or supersaturated in N-(phosphonomethyl)glycine product. In accordance with the claimed process, a ratio of particulate N-(phosphonomethyl)glycine product solids to mother liquor is maintained in the evaporation zone which exceeds the ratio of N-(phosphonomethyl)glycine product solids incrementally produced by the effects of

evaporation to mother liquor incrementally produced thereby. In the context of the claimed invention, it will be understood that the effects of evaporation include both the concentrating effects and cooling effects; but where operation of the crystallizer is substantially adiabatic, as is preferred, crystallization results primarily from cooling of the liquid phase to a temperature at which solubility of N-(phosphonomethyl)glycine product is substantially lower than it is at the temperature of the oxidation reaction mixture. Preferably, the solids/mother liquor ratio in the lower region of the retention zone of the crystallizer shown in Fig. 12A is at least about twice the incremental ratio resulting from evaporation effects, and the concentration of product solids in the crystallization region is also at least twice the concentration incrementally produced. Control of the solids inventory in the evaporation zone as claimed has been found to advantageously provide control of the average particle size of the N-(phosphonomethyl)glycine product of the crystallization process (See, for example, page 132, line 14 to page 133, line 19; and page 134, line 22 to page 135, line 6 of applicants' specification).

Although disclosing the general use of evaporative  
~~crystallization to recover N-(phosphonomethyl)glycine product~~  
solids and a mother liquor from an aqueous solution, none of the cited references remotely disclose the operation of a crystallizer system in accordance with claim 188 including maintenance of the ratio of particulate N-(phosphonomethyl)glycine product solids to mother liquor in the evaporation zone in excess of the ratio of N-(phosphonomethyl)glycine product solids incrementally produced by the effects of evaporation to mother liquor incrementally

produced thereby. Accordingly, applicants respectfully submit that claim 188 and dependent claims 189-215 are patentable over the cited art.

Claims 218 and 231

Claim 218 is directed to a process for the preparation of an N-(phosphonomethyl)glycine product. The process includes cooling a primary crystallization feed mixture comprising N-(phosphonomethyl)glycine product produced by catalytic oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate, thereby precipitating N-(phosphonomethyl)glycine product and producing a primary mother liquor comprising N-(phosphonomethyl)glycine product. The precipitated N-(phosphonomethyl)glycine product is separated from the primary mother liquor and the primary mother liquor recycled and introduced into the liquid reaction medium wherein the N-(phosphonomethyl)iminodiacetic acid substrate is catalytically oxidized to N-(phosphonomethyl)glycine.

The process defined in claim 231 is similar to the process defined in claim 218 except that the product mixture produced by catalytic oxidation of the N-(phosphonomethyl)iminodiacetic acid substrate is divided into a primary fraction and a secondary fraction, N-(phosphonomethyl)glycine product is crystallized from the primary fraction and the resulting primary mother liquor is recycled and used as a source of water in the preparation of the aqueous feed mixture comprising the N-(phosphonomethyl)iminodiacetic acid substrate introduced into the catalytic reactor system.

In accordance with the present invention, it has been discovered that recycle of mother liquor back to the oxidation reaction zone(s) wherein the N-(phosphonomethyl)iminodiacetic

acid substrate is catalytically oxidized to N-(phosphonomethyl)glycine offers several advantages, including (1) providing a source of process water which reduces the water requirements and the volume of waste from the system; (2) allowing the recovery of additional N-(phosphonomethyl)glycine product from unreacted -(phosphonomethyl)iminodiacetic acid substrate in the mother liquor; and (3) since the mother liquor typically remains at a relatively elevated temperature, the recycled mother liquor can advantageously be used to preheat the aqueous feed stream feed mixture containing the N-(phosphonomethyl)iminodiacetic acid substrate and reduce energy requirements.

Morgenstern discloses partially evaporating the oxidation reaction product mixture resulting from the oxidation of **an N-substituted** glyphosate reactant to precipitate at least a portion of the N-(phosphonomethyl)glycine product and recycling at least a portion of the mother liquor centrate remaining after removal of the solid product to the oxidation reactor. Importantly, however, oxidation of an N-substituted glyphosate reactant is not accompanied by the production of considerable quantities of C<sub>1</sub> by-products (e.g., formaldehyde and formic acid) as is the case in the oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate called for in claims 218 and 231. One of ordinary skill in the art upon reading the disclosure in Morgenstern would have no reason to believe that the recycle of mother liquor containing appreciable concentrations of these by-products could be accomplished without having deleterious effects on the oxidation of the N-(phosphonomethyl)iminodiacetic acid substrate. This is particularly the case since the formaldehyde by-product is known to react with the N-(phosphonomethyl)glycine product to

produce unwanted by-products (mainly N-methyl-N-(phosphonomethyl)glycine, sometimes referred to as "NMG") which reduce the N-(phosphonomethyl)glycine product yield. However, in accordance with the present invention it has been discovered that large quantities of mother liquor separated from the precipitated N-(phosphonomethyl)glycine product can be recycled to the oxidation reaction zone(s) without detrimentally effecting the catalytic oxidation of the N-(phosphonomethyl)iminodiacetic acid substrate. Indeed, it has been discovered that by using a preferred oxidation catalyst comprising a noble metal effective to oxidize C<sub>1</sub> by-products to catalyze the oxidation of the N-(phosphonomethyl)iminodiacetic acid substrate, the recycle of mother liquor will often allow for additional oxidation of C<sub>1</sub> by-products contained in the recycled mother liquor (See claim 238).

Similarly, the disclosure of recycling mother liquor to the non-catalytic reaction zone of Fujiwara in which glycolonitrile, carbon dioxide gas, ammonia and water are reacted to produce glycine does not teach or suggest to one skilled in the art the suitability of mother liquor recycle in a process for the production of N-(phosphonomethyl)glycine product by catalytic oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate

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~~as recited in claims 218 and 231.~~

In view of the above, applicants respectfully submit that the process defined in claims 218 and 231 and dependent claims 219-230 and 232-241 are patentable over the cited references.

#### Claim 278

Claim 278 is directed to process for the catalytic oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate to produce an N-(phosphonomethyl)glycine product wherein the oxidation

reaction is carried out in a series of oxidation reaction zones comprising an oxidation catalyst. In accordance with the claimed process an intermediate oxidation reaction product from the the first oxidation reaction zone is introduced into a second oxidation reaction zone comprising a fixed bed containing a noble metal on carbon catalyst and by-product formaldehyde and/or formic acid are oxidized in the second oxidation reaction zone. An advantage of fixed bed reactors is that they can be operated in a manner to exhibit plug flow characteristics which tends to produce lower concentrations of undesirable byproducts (e.g., N-methyl-N-(phosphonomethyl)glycine), and, consequently, a greater N-(phosphonomethyl)glycine product yield. Particularly advantage is realized when a second or subsequent reactor in a series of oxidation reaction zones comprises a fixed bed containing a noble metal on carbon catalyst to assure oxidation of the  $C_1$  by-products present in the intermediate oxidation reaction product. Inasmuch as the  $C_1$  oxidation is substantially first order in any case, it proceeds more effectively under the essentially plug flow conditions that are conveniently maintained in the downstream reactor. In addition, concerns regarding dissipation of exothermic reaction heat and temperature control that might arise when a fixed bed reactor serves as the first oxidation

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reaction zone in the series are largely circumvented in a second or subsequent reactor since the majority of the N-(phosphonomethyl)iminodiacetic acid substrate is preferably oxidized in the preceding reaction zone(s). Moreover when a fixed bed reactor is employed as a second or subsequent reactor in the series, it may be feasible to use a catalyst having a lower noble metal loading per unit weight of catalyst than may be optimal for a continuous back-mixed reaction system.

Neither Morgenstern or Fujiwara teach the use of fixed bed reactors. Furthermore, although Ebner discloses fixed bed reactors used in the oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate, this reference does not teach or suggest using a fixed bed reactor as a second or subsequent reactor in a series of oxidation reaction zones as called for in claim 278, nor the advantages that are attained thereby. Accordingly, in the absence of any teaching of the claimed process configuration, claim 278 and dependent claims 279-289 are respectfully submitted as patentable over the cited references.

**Claims 290, 291, 292, 294, 296, 306, 310 and 315**

Claims 290, 291, 292, 294, 296, 306, 310 and 315 are each directed to processes in which the catalytic oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate to produce an N-(phosphonomethyl)glycine product is carried out continuously in a fixed bed containing an oxidation catalyst. Claim 290 requires that the ratio of the mass flow rate of the liquid phase to the mass flow rate of gas phase in the fixed bed be between about 20 and about 800. In the process of claim 291 the volumetric ratio of the liquid phase holdup in the fixed bed to the total bed volume being between about 0.1 and about 0.5. Claim 292 requires that the partial pressure of oxygen at the liquid exit of the fixed bed be not greater than about 100 psia. In claim 294 the partial pressure of oxygen is required to be not greater than about 50 psia at any location in the fixed bed at which the concentration of N-(phosphonomethyl)iminodiacetic acid substrate in the liquid phase is lower than about 0.1 ppm. In accordance with claim 296, the catalyst surface area to liquid holdup in the



fixed bed is between about 100 and about 6000 m<sup>2</sup>/cm<sup>3</sup>. Claim 306 requires the integrated average partial pressure of oxygen along the liquid flow path in the fixed bed being at least about 50 psia and the integrated average temperature of the liquid phase in the fixed bed being between about 80°C and about 130°C. In addition to oxidation catalyst bodies, the fixed bed of claim 310 contains other means for promoting gas/liquid mass transfer. In the process of claim 315, the liquid phase exit stream is withdrawn from the primary oxidation reaction zone comprising the fixed bed containing an oxidation catalyst and the rate of introduction of the liquid phase feed stream and withdrawal of the liquid phase exit stream is such that the liquid phase hourly space velocity in the fixed bed based on total bed volume is between about 0.5 hr<sup>-1</sup> and about 20 hr<sup>-1</sup>.

As previously noted, neither Morgenstern or Fujiwara teach the use of fixed bed reactors and although Ebner makes mention of the use of fixed bed reactors in the oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate, this reference says nothing about liquid/gas mass flow ratios, the volumetric ratio of the liquid phase holdup in the fixed bed to the total ~~bed volume, the partial pressure of oxygen or the integrated~~ average partial pressure of oxygen at locations in the fixed bed, the catalyst surface area to liquid holdup in the fixed bed, use of means other than oxidation catalyst bodies for promoting gas/liquid mass transfer or the liquid phase hourly space velocity in the fixed bed. The Office action does not purport that any of the claim limitations set forth above, which reflect preferred operation of a fixed bed reactor used in the catalytic oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate,

are taught or suggested by the cited art. Accordingly, applicants submit that the invention defined in independent claims 290, 291, 292, 294, 296, 306, 310 and 315 and dependent claims 293, 295, 297-305, 307-309, 316-325 and 327-336 are patentable over the cited references.

**Conclusion**

Favorable reconsideration and allowance of all pending claims are respectfully solicited.

Applicants request an extension of time to and including February 27, 2003 for filing a response to the above-mentioned Office action. A check in payment of the applicable extension fee is enclosed.

The Commissioner is requested to charge any fee deficiency of overpayment in connection with this amendment to Deposit Account 19-1345.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claims 1, 2, 5, 6, 7, 10, 11, 18, 20, 27, 38, 44, 227 and original dependent claims 337-346 as follows:

1. (amended) A process for making an N-(phosphonomethyl)glycine product, the process comprising:
  - introducing an aqueous feed stream comprising an N-(phosphonomethyl)iminodiacetic acid substrate into an oxidation reactor system;
  - oxidizing N-(phosphonomethyl)iminodiacetic acid substrate in the oxidation reactor system in the presence of an oxidation catalyst to produce a reaction product solution comprising N-(phosphonomethyl)glycine product;
  - dividing the reaction product solution into plural fractions comprising a primary fraction and a secondary fraction;
  - cooling the primary fraction as water is evaporated from the primary fraction under substantially adiabatic conditions by reducing the pressure to precipitate [precipitating] N-(phosphonomethyl)glycine product crystals from the primary

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- fraction to produce a primary product slurry comprising precipitated N-(phosphonomethyl)glycine product crystals and a primary mother liquor; and
- precipitating N-(phosphonomethyl)glycine product crystals from an aqueous secondary crystallization feed mixture comprising N-(phosphonomethyl)glycine product contained in said secondary fraction to produce a secondary product slurry comprising

precipitated N-(phosphonomethyl)glycine product crystals and a secondary mother liquor.

2. (amended) The process as set forth in claim 1 wherein [the primary fraction is cooled to precipitate N-(phosphonomethyl)glycine product crystals from the primary fraction and] water is evaporated from the aqueous secondary crystallization feed mixture to precipitate [precipitating] N-(phosphonomethyl)glycine product crystals from the aqueous secondary crystallization feed mixture.

Claims 3 and 4 have been canceled.

5. (amended) The process as set forth in claim 1 [4] wherein the evaporation cools the primary fraction to a temperature of from about 45°C to about 80°C.

6. (amended) The process as set forth in claim 1 [4] wherein from about 5% to about 30% by weight of the primary fraction is evaporated.

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7. (amended) The process as set forth in claim 1 [4] further comprising decanting primary mother liquor from the precipitated N-(phosphonomethyl)glycine product crystals in the primary product slurry.

10. (amended) The process as set forth in claim 1 [9] wherein the oxidation catalyst comprises a heterogenous catalyst comprising a noble metal deposited on a carbon support.

11. (amended) The process as set forth in claim 1 [10] wherein the N-(phosphonomethyl)iminodiacetic acid substrate is oxidized in a liquid reaction medium in contact with the oxidation catalyst and the chloride ion concentration in the liquid reaction medium is maintained at no greater than about 500 ppm by weight.

18. (amended) The process as set forth in claim 1 [4] wherein the process further comprises purging secondary mother liquor for removal of by-products and impurities from the process.

20. (amended) The process as set forth in claim 1 [4] wherein the primary fraction is from about 30% to about 85% of the reaction product solution.

27. (amended) The process of claim 1 [4] wherein evaporative cooling of said primary fraction comprises:

introducing an aqueous evaporation feed mixture into an evaporation zone, said aqueous feed mixture comprising said primary fraction;

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evaporating water from said aqueous evaporation feed mixture in said evaporation zone in the presence of solid particulate N-(phosphonomethyl)glycine product, thereby producing a vapor phase comprising water vapor, precipitating N-(phosphonomethyl)glycine product from the aqueous liquid phase, and producing an evaporation product comprising N-(phosphonomethyl)glycine product solids and a primary mother liquor that is substantially

saturated or supersaturated in N-(phosphonomethyl)glycine product; and

maintaining a ratio of particulate N-(phosphonomethyl)glycine product solids to primary mother liquor in said evaporation zone which exceeds the ratio of N-(phosphonomethyl)glycine product solids incrementally produced by the effects of evaporation to mother liquor incrementally produced thereby.

38. (amended) The process as set forth in claim 23 [37] wherein said secondary fraction is introduced into a secondary reactor system comprising a tertiary oxidation reaction zone, unreacted -(phosphonomethyl)iminodiacetic acid substrate contained in said secondary fraction being converted to N-(phosphonomethyl)glycine product in said tertiary oxidation reaction zone to produce a tertiary oxidation reaction mixture, said secondary crystallization feed mixture comprising N-(phosphonomethyl)glycine product contained in said tertiary oxidation reaction mixture.

44. (amended) A process for making an N-(phosphonomethyl)glycine product, the process comprising:

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introducing an aqueous feed stream comprising an N-(phosphonomethyl)iminodiacetic acid substrate into an oxidation reactor system;

oxidizing the N-(phosphonomethyl)iminodiacetic acid substrate in the oxidation reactor system in the presence of an oxidation catalyst to produce a reaction product solution containing N-(phosphonomethyl)glycine product;

precipitating N-(phosphonomethyl)glycine product crystals from the reaction product solution to produce a primary product slurry comprising precipitated N-(phosphonomethyl)glycine product crystals and a primary mother liquor; [and]

separating precipitated N-(phosphonomethyl)glycine product from said primary mother liquor; and

evaporating water from the primary mother liquor, thereby precipitating additional N-(phosphonomethyl)glycine product crystals and producing a secondary mother liquor.

Claims 65-95 and 101-217 have been canceled.

227. (amended) The process as set forth in claim 218 wherein N-(phosphonomethyl)iminodiacetic acid substrate is oxidized in said aqueous liquid reaction medium in a primary oxidation reaction zone, thereby producing a primary oxidation product, the process further comprising:

dividing said primary oxidation product into a finishing reaction feed mixture and a primary crystallization fraction, said primary [aqueous] crystallization feed mixture comprising said primary crystallization fraction;

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introducing said finishing reaction feed mixture into a finishing reaction zone; and

catalytically oxidizing residual N-(phosphonomethyl)iminodiacetic acid substrate contained in said finishing reaction feed mixture to N-(phosphonomethyl)glycine product to produce a finished reaction mixture.

Claim 326 has been canceled.

337. (amended) A continuous process for the catalytic oxidation of an N-(phosphonomethyl)iminodiacetic acid substrate to produce an N-(phosphonomethyl)glycine product, comprising:

introducing a first component feed stream comprising an N-(phosphonomethyl)iminodiacetic acid substrate into the first of a series of continuous reaction zones, each of said series of reaction zones comprising an oxidation catalyst;

introducing an oxidant into said first of said series of reaction zones;

catalytically oxidizing said substrate in said first reaction zone to produce an intermediate reaction mixture [stream] containing N-(phosphonomethyl)glycine product;

transferring the intermediate reaction mixture exiting said first reaction zone to the second of said series of reaction zones;

catalytically oxidizing said substrate in each of said series of reaction zones;

withdrawing an intermediate reaction mixture from each of said reaction zones;

introducing into each succeeding reaction zone the intermediate reaction mixture produced in the preceding reaction zone;

introducing an additional component feed stream into each of one or more of said reaction zones succeeding said first reaction zone in said series, each said additional feed stream comprising an N-(phosphonomethyl)iminodiacetic acid substrate;

introducing an oxidant into one or more said reaction zones succeeding said first reaction zone in said series; and

withdrawing a final reaction product from the last in said series of reaction zones.



338 [337]. (amended) A process as set forth [for] in claim 337 [336] wherein an additional component feed stream comprising an N-(phosphonomethyl) [-]iminodiacetic acid substrate is introduced into each of said series of reaction zones.

339 [338]. (amended) A process as set forth in claim 337 wherein an oxidant is introduced into each of said series of reaction zones.

340 [339]. (amended) A process as set forth in claim 339 [338 comprising] wherein there are at least three continuous reaction zones in said series.

341 [340]. (amended) A process as set forth in claim 337 [336] wherein one or more of said additional component feed streams contains solid N-(phosphonomethyl)iminodiacetic acid substrate.

342 [341]. (amended) A process as set forth in claim 337 [336] wherein said N-(phosphonomethyl)iminodiacetic acid substrate comprises a water-soluble salt of N-

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(phosphonomethyl)iminodiacetic acid and the average concentration of said salt among said component feed solutions is such that said final [oxidation] reaction product [mixture] contains at least about 10% by weight of a water-soluble salt of N-(phosphonomethyl)glycine on an acid equivalent basis.

343 [342]. (amended) A process as set forth in claim 342 [341] wherein said average concentration of said salt in said